

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
14 October 2004 (14.10.2004)

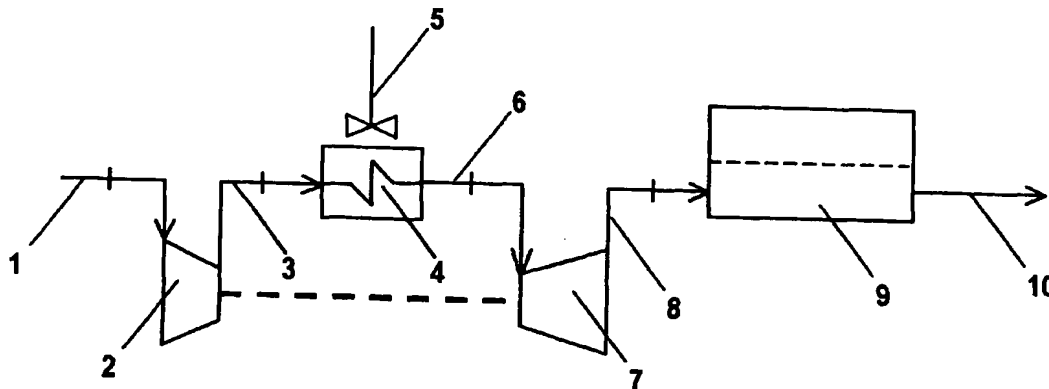
PCT

(10) International Publication Number
WO 2004/088768 A3

- (51) International Patent Classification⁷: **H01M 8/04**
- (21) International Application Number:
PCT/EP2004/003424
- (22) International Filing Date: 31 March 2004 (31.03.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
MI2003 A 000644 1 April 2003 (01.04.2003) IT
- (71) Applicant (for all designated States except US): **NUVERA FUEL CELLS EUROPE S.R.L.** [IT/IT]; Via Bistolfi, 35, I-20134 Milano (IT).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **TRIFONI, Eduardo** [IT/IT]; Via Donizetti, 5, I-80127 Napoli (IT). **FAITA, Giuseppe** [IT/IT]; Via Rivolta, 15, I-28100 Novara (IT). **FLEBA, Gian Piero** [IT/IT]; Via F. Villa, 6, I-20134 Milano (IT). **LENARDON, Matteo** [IT/IT]; Via Unione, 2, I-22074 Lomazzo (IT). **LIOTTA, Marcello** [IT/IT]; Via della Cooperazione, 117, I-20089 Rozzano (IT). **JACOBO, Rubén, Ornelas** [IT/IT]; Via Gorki, 20, I-20098 San Giuliano Milanese (IT). **RAMUNNI, Enrico** [IT/IT]; Via Jannozzi, 40, I-20097 San Donato Milanese (IT). **TRAINI, Fabio** [IT/IT]; Via Pisani Dossi, 31, I-20134 Milano (IT).
- (74) Agent: **REITSTÖTTER, KINZEBACH & PARTNER** (GBR); Sternwartstrasse 4, 81679 München (DE).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- (88) Date of publication of the international search report:
18 August 2005

[Continued on next page]

(54) Title: METHOD FOR OPERATING A MEMBRANE ELECTROCHEMICAL GENERATOR



(57) Abstract: A membrane fuel cell stack characterised by a stable operation under non-humidified air feed at the cathode inlet with a stoichiometric factor higher than 1 and near ambient pressure, even at high current density. This result is obtained by means of an air feed conditioning device comprising a fan or little compressor, a heat exchanger directed to cool the compressed air and an expander allowing to cool the air while recovering part of the energy consumed by the fan.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/003424

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01M8/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00/11745 A (THE REGENTS OF THE UNIVERSITY OF CALIFORNIA) 2 March 2000 (2000-03-02) page 1, paragraph 3 page 3, paragraphs 1,2,7 - page 4, paragraph 1 page 4, line 30 - page 6, line 3 page 6, line 26 - page 7, line 5	1,2
A		3-22
A	WO 02/063708 A (INTERNATIONAL FUEL CELLS, LLC) 15 August 2002 (2002-08-15) page 1, line 3 - page 2, line 23 page 8, line 7 - line 15 page 8, line 21 - line 24 figure 6	1-22
	----- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

13 June 2005

Date of mailing of the international search report

23/06/2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Kuhn, T

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/003424

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 198 22 689 A1 (VOLKSWAGEN AG) 25 November 1999 (1999-11-25) column 2, line 41 - line 49	1,7,9, 11,14, 18,19
A	LIM C ET AL: "Development of high-power electrodes for a liquid-feed direct methanol fuel cell" JOURNAL OF POWER SOURCES, ELSEVIER SEQUOIA S.A. LAUSANNE, CH, vol. 113, no. 1, 1 January 2003 (2003-01-01), pages 145-150, XP004399054 ISSN: 0378-7753 page 145, column 2, paragraph 1	1,14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/003424

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0011745	A	02-03-2000	US 6117577 A	12-09-2000
			AT 236457 T	15-04-2003
			AU 5771799 A	14-03-2000
			CA 2340765 A1	02-03-2000
			DE 69906551 D1	08-05-2003
			DE 69906551 T2	26-02-2004
			EP 1110264 A1	27-06-2001
			WO 0011745 A1	02-03-2000
WO 02063708	A	15-08-2002	US 6586123 B1	01-07-2003
			DE 10296228 T5	15-04-2004
			JP 2004521451 T	15-07-2004
			WO 02063708 A1	15-08-2002
DE 19822689	A1	25-11-1999	CN 1301407 A , C	27-06-2001
			DE 59904539 D1	17-04-2003
			WO 9960646 A1	25-11-1999
			EP 1082773 A1	14-03-2001
			JP 2002516468 T	04-06-2002
			TW 442997 B	23-06-2001